THE VALUATION OF INTAKA ISLAND: A COMPARISON OF THE CONTINGENT VALUATION METHOD AND HEDONIC PRICING ANALYSIS

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Intaka Island

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ABSTRACT

There are an increasing number of techniques used in the valuation of environmental services. Contingent valuation is the most frequently used stated preference technique, while hedonic pricing analysis is an alternative revealed preference technique employed for the determination of the value attached to a public good. This paper uses both techniques to study the utility generated by Intaka Island, a 16-hectare nature area situated in a rapidly developing area of Cape Town. The results of the contingent valuation surveys indicated that the members of the public would derive utility from both the use and continued existence of Intaka Island. It also identified a number of significant variables affecting the willingness-to-pay of the respondents in the area. The hedonic pricing analysis suggested that developers may be undervaluing the commercial property in the area by ignoring the environmental dimension in their administered pricing of floor space. In contrast, residential property prices in the area attach a significant value to the functions of Intaka Island. The results support the hypothesis that Intaka Island is undervalued as an environmental resource.

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1. INTRODUCTION

Welfare economics assumes that the purpose of an economic activity is to increase society's or an individual's well-being given a set of well-defined preferences. Clearly, an individual's welfare is not only based on the consumption of private goods, but also on the quality and quantity of public goods, including non-market services provided by the environment, such as the health benefits associated with clean air. Assuming that individuals wish to maximise their welfare, their decisions will involve the comparison of the alternative uses of such resources. Some uses may present the asset as a full private good, while in other cases, the market may be missing. Specifically, welfare economics is based on the property of substitutability: the idea that although an individual's consumption of one good can be reduced, his or her overall utility can remain unchanged if s/he increases the consumption of an alternative good.

This idea that a rational welfare maximising individual chooses more of one good at the expense of another indicates that there must be an implicit or explicit value attached to both goods. Thus, the monetary value attached to a good – its price - is also the revealed value of the marginal unit. Where the market price of a good is unknown, the change in welfare attached to the marginal unit can be expressed in the form of willingness-to-pay or willingness-to-accept.

The elicitation of value measures, such as the willingness-to-pay for environmental services, remains a contentious issue. In 1947, Ciriacy-Wantrup acknowledged the need for a method to elicit the value placed on a public good, such as natural resources, due to increasing scarcity of these goods (Portney, 1994). Environmental services are often public goods, and even when private, the markets that generate prices for them are frequently incomplete. This lack of information inhibits policy-makers' decision-making. In addition to this, policy-makers may also be concerned with objectives beyond economic efficiency, such as equity considerations and intergenerational effects. Under these circumstances, the value attached to the public goods may be underestimated, resulting in substantial damages to the public goods themselves.

The missing markets for many environmental amenities make market prices inappropriate measures of the utility that these amenities may provide. Not only the use values, but also the "existence values", they offer may be ignored. The full set of

public preferences is unlikely to be recognised if simple market prices are used as a basis for decision-making.

In an attempt to account for these problems, methods such as contingent valuation (CVM) and hedonic pricing were developed. These methods aimed to correct for inaccurate valuation of environmental amenities. Contingent valuation is based on the elicitation of willingness-to-pay through surveys, and is therefore based on the public's stated willingness to spend. By contrast, revealed preference methods are based on the amounts they actually "have spent". Since its development, CVM has been subjected to a number of criticisms, such as vulnerability to response effects and the non-verifiability of responses from "ordinary people".

Hedonic pricing is a revealed preference technique. Such techniques derive the utility generated by an environmental amenity indirectly, from the public's revealed preferences for related products. Broadly, it combines the characteristics of residential and commercial properties, and those properties' prices, in a regression analysis. The outputs are used to determine the value attached to an environmental service or quality. Due to its numerous assumptions and technical requirements, the validity of the method too has come under fire.

This paper uses contingent valuation and hedonic pricing analysis to estimate the value attached to a small, multi-purpose nature area, Intaka Island, situated on the Cape Peninsula. Intaka Island, previously known as Blouvlei, remains little known to the general public, despite the integral role it plays in the ecology of the surrounding area, as the nature area provides a habitat for numerous bird and plant species. Despite its conservation status, Intaka Island has no true commercial value in its present use. This leaves environmental lobbyists in a weak bargaining position.

Environmental Impact Assessments (EIAs) provide information on the baseline statuses of environmental assets such as Intaka Island and compares them under alternative development options. It rarely addresses the utility derived from such assets. Fortunately, increased awareness of the scarcity of natural resources has allowed environmentalists to insist on the continuing environmental assessment of impacts in the modern EIA process. To more fully inform its decision making, and as part of the ongoing management scheme, the Blouvlei Environmental Committee required empirical evidence regarding the utility provided to the public by Intaka Island.

2. THEORETICAL FRAMEWORK AND METHOD

Changes in welfare resulting from the introduction of new products, or changes in the prices of existing ones, are often addressed in economics using "consumer surplus" as a measuring rod. Where theoretical correctness is needed, the economist insists that this change in consumer surplus be the area under the Hicks-compensated demand curve for a market good, and the marginal willingness-to-pay curve for a non-market good, such as the services provided by environmental resources (Freeman, 1999, p. 93)[1]. However, it is not possible to measure the willingness-to-pay for such amenities through direct observations of the market, and consequently, four approaches have been developed to determine such demand and value such information (Freeman, 1999, p. 93). Two of these four approaches are based on the direct estimation of the utility enjoyed from the non-market good, either from examining transactions or by eliciting the willingness-to-pay or -to-accept compensation in hypothetical valuations of the amenity. These methods are often referred to as *stated preference* methods, and include contingent and conjoint valuation[2].

Alternatively, an indirect revealed preference method may be used. Hedonic pricing or travel cost data may be used to value the utility provided by an environmental resource. These methods are based on the premise that there is a relationship between the observable demand for marketed goods (such as property prices in a particular suburb), and the unobservable demands for environmental amenities (such as air quality in that suburb).

[1] A basic problem facing economists when measuring welfare has been whether to use consumer surplus, based on the Hicks-compensated demand function (in theoretical terms, compensated and equivalent variation) or to base it on the area under the flawed Marshallian demand function. Willig (1976) examined the magnitude of the differences between these alternative measures, and argued that "in most applications the error of approximation will be very small. In fact the error will often be overshadowed by the errors involved in estimating the demand curve" (p. 589)

[2] It is interesting to note that conjoint analysis uses an element of revealed preference, but has been defined as a stated preference technique (Russell, 2001).

2.1 Stated Preference Methods: Contingent and Conjoint Valuation Methods

The *contingent valuation* method asks "how much additional money are individuals willing to pay for extra quantities of a good?" so as to determine those individuals' demand curves, and thereafter, by summing these results, to derive an aggregate market demand curve.

The contingent valuation method uses surveys to create hypothetical markets for an environmental resource, thereby encouraging respondents to directly express their willingness-to-pay for the environmental amenity and possible changes in the availability of the resource. The "willingness-to-pay" (WTP) responses elicited from participants are regarded as approximate measures of price. Assuming information on marginal costs or market prices is available, the economic welfare provided by the resource, or more specifically, the Hicksian consumer surplus can be calculated.

Mathematically, consider an individual with the utility function

$$U = u(\boldsymbol{X}, q)$$

where X = a vector of quantities of private goods

q = level or environmental or resource quality

Importantly, by entering environmental quality into the utility function, the assumption is made that an individual will in fact realise changes in environmental quality, even if only indirectly. Rather than conventionally assuming that the individual will maximise utility subject to a budget constraint, the Hicksian-compensated inverse demand function or *marginal willingness-to-pay* can be derived by assuming that the individual will minimise expenditure ($\Sigma p_i * x_i = \boldsymbol{M}$ where $\boldsymbol{M}$ = money income) subject to a constraint that utility equals a certain level ($U = u^0$). Further assuming that the individual takes q as given and does not have to pay a price for the level of environmental quality, the solution to this problem will yield the expenditure function

$$\boldsymbol{M} = e\,(\boldsymbol{P}, q, u^0)$$

where $\boldsymbol{P}$ = vector of private good prices

The derivative of this function with respect to q, the *marginal willingness-to-pay* for changes in q can be determined as

$$w_q = - \delta e(\boldsymbol{P}, q, u^0) / \delta q$$

where w_q = *marginal willingness-to-pay* (Freeman, 1999)

More simply, Kahneman asserted that, regardless of the method of questioning, the underlying assumption is " that there exists a set of coherent preferences for goods, including non-market goods such as clean air and nice views; that these preferences will be revealed by a proper market; and that these preferences can be recovered by CV [contingent valuation]" (cited in Schkade and Payne, 1994, p. 90).

However, there is continuous debate surrounding the validity of the "set of coherent preferences" mentioned by Kahneman above (cited in Schkade and Payne, 1994, p. 90). Increasingly it is being argued that people construct their preferences, as defined by $U = u(\boldsymbol{X}, q)$, according to the methodology employed in the survey. As one example, Kahneman and Knetsch (1992) argue that there is an "embedding effect": a tendency for willingness-to-pay responses to be similar across surveys for identical services but in different magnitudes, even when theory suggests the contrary. In other words, a respondent's WTP is invariant with respect to size, implying that a respondent would have a WTP to maintain the quality of *one* wetland area that is approximately equal to their WTP to maintain the quality of *five* wetland areas. The embedding effect is said to result from the nonexistence of individual preferences for the public good in question, and from the failure of respondents to consider their realistic budget constraints carefully (Schkade and Payne, 1994, p. 91).

Another criticism is that there is a consistent difference between mean WTP results gathered from similar samples using open-ended and "dichotomous" questions (Russell, 2003, p. 176). These discrepancies have led critics to argue that, in addition to the value of the resources, the respondent may be attaching a "warm-glow of giving" or a feeling of moral satisfaction to the process (Schkade and Payne, 1994, p. 91). Furthermore, many argue that the payment vehicle proposed in the survey influences a respondent's willingness-to-pay (Diamond and Hausman, 1994; Mitchell and Carson, 1989).

Finally, Diamond and Hausman (1994) suggest that even if willingness-to-pay is being measured accurately, there is still an altruistic component present. More

specifically, respondents may be willing to pay a certain amount because of their concern for others rather than expressing an individual preference for preservation.

Broadly, the criticisms of these economists suggest that respondents to a contingent valuation survey may in fact be responding to something other than the environmental resource under evaluation (Schkade and Payne, 1994; Diamond and Hausman, 1994; Kahneman and Knetsch, 1992; Mitchell and Carson, 1989).

Given the criticisms of the contingent valuation methodology, alternative methods of eliciting preferences from respondents were developed. One such method is *conjoint analysis* (CA). In CA studies, respondents rank or rate bundles of differing attributes associated with the environmental resource. The intention is to estimate the marginal rates of substitution between the different attributes. An advance on conjoint analysis is *choice modelling*. Choice modelling was originally developed in the marketing and transport literature by Louviere and Hensher in 1982 and Louviere and Woodworth in 1983 (Morrison *et al.*, 1998, p. 1). The fundamental idea of choice modelling is to create a hypothetical market situation and elicit preferences for attributes by making individuals choose between certain alternatives. Studies using the choice modelling method for the evaluation of wetlands include Morrison *et al.* (1999) and Carlsson *et al.* (2003).

Morrison *et al.* (1998) investigate the trade-off between non-use values in job losses and environmental quality associated with the Macquarie Marshes in Australia. In this study, it was found that people were willing to pay to increase the wetland area, the frequency of waterbird breeding, and the number of protected and endangered species in the area. In a similar style, Carlsson *et al.* (2003) used choice modelling as a means of valuing the different attributes of a wetland. The results presented in the paper suggest that the marginal willingness-to-pay was highest for the promotion of plant, animal and insect life. In both these cases, the non-use economic values of environmental attributes were estimated. Notably, Carlsson *et al.* recognised that the results revealed in their study were undoubtedly contextual, i.e. "they are the result of a certain study conducted in a specific community" (Carlsson *et al.* 2003, p. 101). This confirms the possibility of the embedding effect as suggested by Kahneman and Knetsch (1992), as it seemed that respondents in this study were in fact reacting to the context of the survey, and not necessarily expressing their individual preferences for promotion of environmental resources. This implies that the embedding effect is

not only a feature of CVM, but that it also appears in alternative hypothetical market techniques.

2.2 Revealed Preference Method: Hedonic Pricing

Under the assumptions of the hedonic model, the level of environmental quality is considered to be a qualitative characteristic of an existing market good. Essentially, individuals choose their level of consumption of the environmental quality through their choice of the market good, or more specifically, through their choice of a private goods consumption bundle (Freeman, 1999, p. 98). The market for the private goods indirectly acts as the market for the environmental service. For example, residential housing prices may include a premium for the proximity to the coast or ocean, and a discount for suburban living. If this is the case, then house prices should capture the value attached to the aesthetic pleasure surrounding a residential house. These price differentials are understood to represent the implicit prices for different levels of environmental services.

The hedonic pricing approach is based on the premise that the price is determined by a set of attributes associated with it, such that

Property price = *F* (*property variables, neighbourhood variables, accessibility variables, environmental quality variables*)

where *property variables* : erf and house size[3]

neighbourhood variables : level and quality of public services

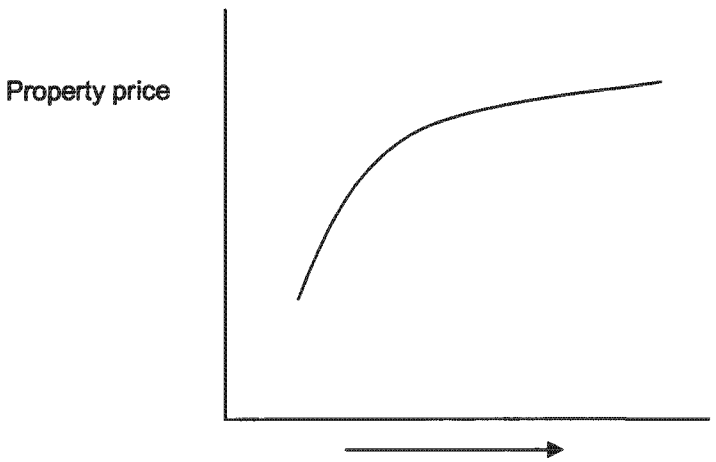
accessibility variables : proximity to the central business district

environmental quality : pollution levels; proximity to environmental resource, such as wetland or the ocean; views; local negative externalities such as point source pollution or noise

[3] Additional features such as the number of rooms, garages, domestic assistant quarters and pools can also be included, but empirical evidence in South Africa has shown that there is significant collinearity between these variables, and they are therefore of no use in stepwise regression or principal components analysis (Harding *et al*, 2001).

Graphically, the price is expected to rise with improvements in environmental quality, as depicted in Figure 1. At the margin, price would be expected to increase at a declining rate with marginal increases in environmental quality.

Figure 1: Property price as a function of environmental quality only



Although the strength of the hedonic pricing approach is that it derives values from actual market experience, significant statistical analysis is dependent on the existence of complete information from reliable sources. In addition to this, the market is assumed to be in competitive equilibrium. This assumption requires full information, no transaction costs, and no time-lags in pricing adjustments (Russell, 2003, p. 144). In addition to this, individuals responding to the market must appreciate the effects of the environmental amenities under evaluation. If the hedonic market is relatively controlled or distorted, hedonic analysis becomes problematic. Fortunately the property market in Cape Town is both competitive and well informed, while the environmental aspects of the market in question are long standing and easily perceived, meaning that the speed of price adjustment to new information is not a serious issue.

This paper will aim to use both CVM and Hedonic Pricing to explore the value and utility provided by a wetland area.

3. BACKGROUND TO INTAKA ISLAND

The focus of this paper is Intaka Island, a 16-hectare nature area situated within the Century City development. The Century City development is approximately 8 kilometres from the Cape Town Central Business District (see Map 1). The 250 hectare site includes: the Canal Walk Shopping Centre; the theme park Ratanga Junction; *The Island Club* residential development; an area containing a number of office properties, and; currently undeveloped open space (see Figure 2).

Prior to the development of this nature area, the main wetland systems on the site consisted of an ephemeral pan to the east and a permanent water body to the west, referred to as Blouvlei A and Blouvlei B respectively. These central wetlands covered an area of approximately 20 hectares. At this time, the vegetation on site fell into three categories:

1) areas of open sand: covering approximately 30 percent of the area
2) areas of Pan wetland vegetation: covering approximately 10 percent of the area
3) dense alien vegetation: covering approximately 60 percent of the area, with a diversity of Sand Plain fynbos interspersed.

Without human impacts, the vegetation on site would have consisted primarily of Sand Plain Fynbos, while certain sectors of the site would have been transitional to Strandveld vegetation (Environmental Impact Assessment, 1996, p. 26). Given that only 1.2 percent (500 ha) of the original Cape Flats distribution of Sand Plain Fynbos remains, the area was given *high conservation value* in the EIA (McDowell and Ball, Environmental Impact Assessment, 1996, p. 28).

In addition to this, Blouvlei B was home to approximately 5000 birds of 52 species, of which 3860 breeding birds of 12 species made up the heronry. However, in its pristine state, Blouvlei B is unlikely to have supported a heronry (Environmental Impact Assessment, 1996, p. 35). The increase in species and frequency of species breeding on the site was attributed to: a) the construction of artificial water bodies, and; b) the planting and spreading of alien trees. Without intervention, Blouvlei would gradually have declined in importance as a bird habitat due to the gradual disintegration of the dead alien *Acacia saligna* in the area[4].

[4] It is ironic that this area is unlikely to have been of much importance in its pristine state and without intervention, yet in the presence of alien vegetation has led to its development as a conservation area.

Recognising these issues, the Environmental Impact Assessment in 1996 recommended the development of the "multi-purpose" nature area now known as Intaka Island. The aims of Intaka Island are to:

a) Conserve a rare and threatened vegetation type
b) Conserve a rare type of wetland habitat
c) Provide a habitat for birds, especially breeding waterbirds
d) Cleanse the water which is used in the network of canals at Century City
e) Provide Century City with a beautiful and healthy 'green lung'
f) Provide the people of Cape Town with a recreational and educational amenity[5].

Intaka Island is separated into three components (see Figure 3):

1) the Constructed Wetland Zone
2) the Ephemeral Salt Pan Zone
3) the Perimeter Canal around Intaka Island and the wider waterways and canals of the Century City site.

The constructed wetland was designed to treat and polish incoming recycled wastewater to a quality suitable for the third component, the main canal system. This wastewater is made available by the nearby Potsdam sewerage works. The water circulates through four ponds, and through a natural process, is cleaned and purified.

In addition to purification, artificial habitats for the heronry have been constructed in Pond 3 to encourage nesting and breeding. These artificial habitats are known as the "Weyers Platforms", and are the first of their kind in the world. Their success is reflected through the steadily increasing number of birds entering the area, and the rising proportion of breeding pairs. This trend is expected to remain constant in the future. A total of 127 "target" species have been cited in the area, while the number of waterbird species breeding in the area has increased to 48. In addition to this, 177 species of Sand Plain Fynbos have been recorded on site, ten of which are Red Data species (Blouvlei Information Brochure, May 2004).

Intaka Island is open to the public with a payment of a R5 entrance fee per person. However, between its official opening in October 2000 and December 2003, only

[5] Blouvlei Information Brochure, May 2004

about 4000 visitors were recorded. Nevertheless, 2000 of these visitors were recorded in 2003, implying an increasing awareness of this area.

Although rising visitor numbers improve the financial status of Intaka Island, at any point in time there has to be limited access into Intaka Island due to its small size (Blouvlei Environmental Committee, pers. comm., February 2004). However, current average visitor numbers are substantially below the maximum capacity. An additional concern facing members of the Blouvlei Environmental Committee (BEC) involves the quality of the recycled water entering Intaka Island. As a result of the substantial development in the surrounding areas, the Potsdam sewage works is placed under tremendous pressure, thereby affecting the quality of the recycled water. During the rainy seasons, this issue diminishes in importance but never disappears.

Map 1: Century City Development

Figure 2: Description of the site

Figure 3: Intaka Island

View of Canal Walk Shopping Centre *from Intaka Island*

A "Weyers Platform" shadowed by commercial property houses

Channel of Intaka Island as seen from a bridge

Construction of The Island Club *as seen from Intaka Island*

View of Table Mountain as seen from Intaka Island

A view of the proximity of The Island Club *to Intaka Island*

4. SURVEY DEVELOPMENT AND DESCRIPTION

The survey for this study was developed following preliminary discussions with members of the public in the Canal Walk Shopping Centre and the greater Cape Town area. In addition to this, the objectives of the study were outlined by the Blouvlei Environmental Committee (BEC).

Preliminary questioning suggested that the general public was completely unaware of Intaka Island, and consequently had never visited the area. However, the existence of the Perimeter Canals was known to 100 percent of the respondents in preliminary questioning. Thus, it was imperative in survey design that the benefits and functions of Intaka Island were distinguished from those associated with the Perimeter Canal, so as to differentiate between the alternative values attached to these two bodies of water. Furthermore, the location and environmental value of Intaka Island had to be clearly specified so as to ensure that there was no uncertainty surrounding the questions being posed.

To be acceptable to the public, the survey had to be kept short; it was restricted in length to 3 double-sided pages. It was developed with the assistance of other researchers from the University of Cape Town[6]. For the complete survey, see Appendix A. Firstly, for clarification purposes, an example of the method required in filling out the survey was presented. Following this, the current status of wetland areas on the Cape Peninsula was briefly explained. The respondents were then informed about the current status of Intaka Island and broadly briefed on its associated vegetation and birding attributes. Subsequently, respondents were asked to rank 5 environmental issues within the Cape Peninsula area, including maintaining the wetland quality of Intaka Island, as illustrated in Table 1.

[6] Thanks to Alison Joubert (Statistics), Anthony Leiman (Economics) and Jane Turpie (Fitzpatrick Institute).

Table 1: Environmental issues provided for ranking by respondents in Intaka Island Survey

Please could you rank these environmental issues according to their level of importance from your perspective (eg. 1 is the most important issue, 5 is the least important issue).

Environmental Issue	Ranking
Controlling urban sprawl on the Cape Peninsula	
Improving water quality of the Liesbeek River	
Maintaining wetland quality of Intaka Island	
Promoting water recycling in Cape Town	
Preventing over-fishing on the Cape Peninsula	

This was included as a means to evaluating the respondent's knowledge and preferences to environmental issues. More specifically, a respondent's ranking was measured against a "model answer"[7] and by using a simple numerical calculation, a respondent's environmental awareness was determined[8]. However, in addition to this, the respondent's ranking of Intaka Island was also taken into account in survey analysis.

The respondent's knowledge of the existence of Intaka Island or Blouvlei was then determined. Next, the specific attributes of Intaka Island were identified, and the willingness-to-pay was elicited from respondents. Respondents firstly stated whether they regarded 5 Rand as a fair price. If 5 Rand was considered to be a fair price, the respondents were then asked whether they would be willing to pay more than 5 Rand, and if so, how much? The structure of the survey was such that a lower-bound of 5 Rand, the current entrance fee, was implied.

[7] This "model answer" was determined by taking the average of 5 ranking sets as provided by the author.

[8] More specifically, the sum of the absolute values of the differences between the respondent's ranking and the "model answer" was calculated. The lower the result, the more environmentally aware the respondent.

Example 1: Specified current attributes as defined in Intaka Island Survey

These are the current benefits associated with Intaka Island

Feature	
Size of Nature Area	16 hectares
Percentage area of healthy fynbos	74
Number of bird species	130
Number of waterbird species	52
Number of waterbird species breeding	48
Water quality of the canals	Good
Entrance fee	R5

In order to monitor the stability of preferences, an additional willingness-to-pay was elicited for "a boat trip from Canal Walk via the canal system, *including the entrance fee*". Respondents were asked if they would use this service. Unfortunately, the issue of repeat visits was not addressed in the survey. The potential implication that only a single visit was at issue might have left respondents less prudent in their willingness-to-pay responses.

Example 2: Willingness-to-Pay elicited for a Boat Trip, including the entrance fee, as described in the Intaka Island Survey.

It is possible to get to Intaka Island by car and by boat via the canal system. The service by boat is unfortunately currently unavailable, yet has been offered in the past. Would you be more interested in visiting Intaka Island

a) by car ☐
b) by boat from Canal Walk ☐
c) Both of the above ☐

What do you think is a fair price for a **trip by boat**, including the entrance fee, to the nature area?
R_____

Finally, an attempt was made to measure the respondent's position on intergenerational equity. The respondent was informed about the growing threats to bio-diversity on the Cape Peninsula, and asked to choose one of three management options for wetland areas "in the future". The options included the "baseline"/current scenario, a scenario of increased nature area, a scenario of decreased nature area, and a scenario displaying indifference to the management option chosen for Blouvlei (see Appendix A, Section C).

The socio-economic data of the respondents were then elicited, including age, occupation, sex and total monthly household income before tax. The survey was translated into Afrikaans for non-English speakers, ensuring that respondents were given the option to answer in their preferred language. In addition to this, before answering any monetary questions, each respondent was asked to keep in mind their available income and the set of alternative items on which their income might be spent.

5. DATA DESCRIPTION

Three different groups of people are likely to be immediately affected by the status of Intaka Island:

1) *Shop employees*: those who work in the Canal Walk Shopping Centre, which is adjacent to Intaka Island.
2) *Shoppers*: those who shop in the Canal Walk Shopping Centre.
3) *Office employees*: those who work in the offices surrounding Intaka Island.

Surveys were distributed to members of these three groups. Table 2 depicts the response details to the surveys.

Table 2: Response details for surveys

	Overall	***Shop employees***	***Shoppers***	***Office employees***
Number of surveys distributed	300	100	100	100
Number of surveys collected	251	100	96	55
Number of final (usable) surveys	213	81	84	49
Response rate 1 (%)	-	100	100	38.2
Response rate 2	-	-	-	9.1
Response rate 3	-	-	-	16.4
Response rate 4	-	-	-	36.3

For complete descriptive statistics of the responses, Table 4 (see p. 26) was constructed and will be discussed further.

5.1 Overall sample

The mean willingness-to-pay for an entrance fee for all members in this sample was R9.91 - roughly double the current entrance fee. The mean willingness-to-pay for the entrance fee as calculated through the boat trip was R11, 41[9]. Thus, in the *Overall sample*, there is roughly a 15 percent discrepancy between these mean entrance fees. This indicates an element of inconsistency in the responses. A total of 52 percent of respondents had heard of Intaka Island, and yet 73 percent chose Management Option 1 as the preferred choice of future management of wetlands such as Intaka Island. The majority of respondents (37 percent) earn a monthly household income between R6 000 and R15 0000. Only 33 percent of respondents

[9] Willingness-to-pay for entrance fee through boat trip = (Willingness-to-pay for the boat trip, *including* the entrance fee) – (Willingness-to-pay for the entrance fee).

were male, owing to a high proportion of female shop employees. The average age of respondents in the sample was 32.79 years.

5.2 Shop employees

In the case of *Shop employees*, surveys were dropped off randomly and picked up within the same day. The mean willingness-to-pay as an entrance fee within this category lies below survey mean willingness-to-pay (R8.38), which is an interesting, but not entirely surprising, result, given that these are respondents spending a large proportion of their time adjacent to Intaka Island. From a policymaker's perspective, an important piece of information to emerge was that despite this proximity, only 43 percent of respondents had heard of the wetland. Probably more important in explaining the disparity in willingness-to-pay is that no respondents in this category earned an income of more than R50 000 per month, the final income category provided. Furthermore, almost 50 percent of these respondents earned less than R6 000 per month, whereas only 16 percent of the respondents in the *Shoppers* category fell into this category. This income differential between groups of respondents is likely to be an influential factor affecting the willingness-to-pay displayed by respondents. Despite this, 64 percent of respondents within *Shop Employees* chose Management Option 1 (increased nature area) as their preferred option for the future of wetlands such as Intaka Island.

5.3 Shoppers

Random shoppers in the shopping centre were asked to complete the survey. The socio-demographics of the sample were close to the Canal Walk average for all categories, as shown in Table 3, suggesting low levels of sampling bias for this group of respondents.

Table 3: Socio-demographics for respondents in the *Shoppers* group

Characteristic	***Sample Average (%)***	***Population Average[1] (%)***
Sex: Female	56	54
Male	44	46
Language: English	68	62
Afrikaans	32	29
Income level	R11 200	R10 000
Age (Years)	34	39

[1]Canal Walk Marketing Department, May 2004

	Overall (N=213)				Shop employees (n=81)				Shoppers (n=84)				Office employees (n=49)			
	Mean	St dev	Min	Max	Mean	St dev	Min	Max	Mean	St dev	Min	Max	Mean	St dev	Min	Max
Dependent variable																
WTP as an entrance fee	9.91	5.97	5.00	35.00	8.38	4.47	5	20	12.01	7.39	5.00	35.00	8.65	3.96	5.00	20.00
Ln(WTP as an entrance fee)	2.14	0.53	1.61	3.56	2.01	0.47	1.61	3.00	2.31	0.58	1.61	3.55	2.06	0.44	1.61	3.00
Independent variables																
Environmental awareness	6.18	3.11	0.00	12.00	6.62	2.96	0.00	12.00	5.43	3.20	0.00	12.00	6.75	2.96	0.00	12.00
Rating of Intaka Island	3.45	1.34	1.00	5.00	3.23	1.4	1	5	3.74	1.21	1.00	5.00	3.29	1.40	1.00	5.00
Knowledge of Intaka Island	0.52	0.50	0.00	1.00	0.43	0.50	0.00	1.00	0.38	0.49	0.00	1.00	0.90	0.31	0.00	1.00
Management option 1	0.73	0.45	0.00	1.00	0.64	0.48	0.00	1.00	0.75	0.44	0.00	1.00	0.83	0.38	0.00	1.00
Management option 2	0.03	0.12	0.00	1.00	0.025	0.16	0.00	1.00	0.04	0.19	0.00	1.00	0.00	0.00	0.00	0.00
Management option 3	0.03	0.18	0.00	1.00	0.012	0.11	0.00	1.00	0.05	0.21	0.00	1.00	0.04	0.20	0.00	1.00
HHI:R1000-R3000	0.11	0.31	0.00	1.00	0.26	0.44	0.00	1.00	0.02	0.15	0.00	1.00	0.00	0.00	0.00	0.00
HHI:R3000-R6000	0.20	0.40	0.00	1.00	0.27	0.45	0.00	1.00	0.14	0.35	0.00	1.00	0.19	0.39	0.00	1.00
HHI:R6000-R15 000	0.37	0.48	0.00	1.00	0.30	0.46	0.00	1.00	0.37	0.49	0.00	1.00	0.48	0.50	0.00	1.00
HHI:R15 000 – R50 000	0.26	0.44	0.00	1.00	0.15	0.36	0.00	1.00	0.36	0.48	0.00	1.00	0.27	0.45	0.00	1.00
HHI: >R50 000	0.05	0.22	0.00	1.00	0.00	0.00	0.00	0.00	0.10	0.30	0.00	1.00	0.06	0.24	0.00	1.00
Age	32.79	9.65	17.00	62.00	29.02	8.09	18.00	51.00	34.32	10.14	17.00	62.00	36.48	9.21	21.00	56.00
Sex	0.33	0.47	0.00	1.00	0.25	0.43	0.00	1.00	0.44	0.5	0.00	1.00	0.29	0.46	0.00	1.00

Table 4: Descriptive statistics

At R12.01, the mean willingness-to pay as an entrance fee for *Shoppers* was much higher than that of the *Shop employees*. On the other hand, only 38 percent of respondents in this category had heard of Intaka Island. The fact that these respondents were willing to pay a higher entrance fee for Intaka Island despite not knowing about it suggests that respondents in this category had a higher regard for environmental resources, which was supported by the fact that *Shoppers* were marginally more environmentally aware than the *Overall* average (5.43 for *Shoppers*, 6.18 for *Overall*)[10]. Furthermore, 75 percent of respondents preferred an increased nature area with a higher entrance fee as their management option. Nevertheless, given that approximately 46 percent of respondents in this group had monthly incomes in excess of R15 000, the increase in the entrance fee associated with the Management Option 1 was not likely to affect their choice of management option. This is further substantiated by the relatively higher mean willingness-to-pay. However, the fact that only 23 percent of respondents did not have an "8 to 5" occupation[11] implies that the mean willingness-to-pay and choice of management option does not reflect availability of time, but rather a genuine preference for environmental amenities.

5.4 Office employees

It must be noted that the sample size for this category is smaller than the other categories as a result of financial constraints, which may have affected the results for this category. Nevertheless, four attempts were made to pick up surveys from office employees, and as can be seen in Table 2, the response rate on all returns was low.

As expected, 90 percent of respondents had heard of the wetland prior to the survey, and yet the mean willingness-to-pay (R8.65) was below that of *Shoppers*. However, the level of environmental awareness in this group was the lowest of all groups in the *Overall* sample. On the other hand, 83 percent of respondents displayed concern for the future of wetlands such as Intaka Island by choosing Management Option 1.

[10] As defined in footnote 8, the lower the result, the more environmentally aware the respondent.
[11] The occupation of the respondent was elicited during the survey, and then further classified as a "8 to 5" occupation according to the author. More specifically, non-"8 to 5" jobs include students, housewives, pensioners and artists.

For further analytical purposes, this category was further divided into two groups:

a) those who were situated directly adjacent to Intaka Island (*Adjacent*).
b) those who were situated on the other side of the road to Intaka Island (*Opposite*).

The response rate for those in the *Adjacent* group was 100 percent, as compared to 65 percent for the *Opposite* group.

Table 5: Descriptive statistics for *Adjacent* and *Opposite* groups of *Office employees*

	Adjacent	***Opposite***	***All office employees***
Mean WTP as an entrance fee (Rand)	10.16	7.89	8.65
Environmental awareness	7.25	6.25	6.75
Rating of Intaka Island	2.81	3.53	3.29
Knowledge of Intaka Island (%)	100	84	90
Management option 1 (%)	100	75	83
Management option 3 (%)	0	4	4
HHI:R3000-R6000 (%)	20	18	19
HHI:R6000-R15 000 (%)	53	46	48
HHI:R15 000 – R50 000 (%)	26	28	27
HHI: >R50 000 (%)	5	6	6
Age (Years)	35	36	36.43
Sex (%)	26	31	0.29

Table 5 provides the descriptive statistics for the separated *Adjacent* and *Opposite* groups. Most interestingly, the mean willingness-to-pay by those in the *Adjacent* category is R10.16, as compared to R7.89 for *Opposite* respondents. This suggests that members of the *Adjacent* category ranked Intaka Island as having a high level of importance relative to alternative environmental issues, despite the fact that respondents in the *Opposite* group displayed a higher level of environmental awareness. Finally, every member of the *Adjacent* group preferred Management Option 1, whilst only 84 percent of the *Opposite* group displayed this preference. These results imply that informed employees believed that Intaka Island could be a source of utility provided that they were situated in a position that enabled them to take easy advantage of it.

6. RESULTS

The null hypothesis of this paper is that Intaka Island is, in fact, undervalued as an environmental resource. It is hoped that through the use of these alternative approaches, the results obtained will verify the premise upon which this paper is based.

6.1 Stated Preference Method: Contingent Valuation Method

A limited dependent variable model is a model where the observed dependent variable is constrained. More specifically, the Tobit model involves an observed dependent variable which is constrained to exceed zero. Due to the fact that there was a lower bound of R5 placed on a respondent's willingness-to-pay, the data is censored and the Tobit was the most appropriate analytical tool for estimation in this paper. Separate Tobits were run for each group of respondents in LIMDEP Version 8.0 (2002). A description of the variables included in the model can be found in Table 6.

The basic Tobit

The survey was designed so as to elicit responses from two groups of respondents: those who were only willing to pay the current entrance fee of R5, and; those who were willing to pay more than R5. Consequently, a basic Tobit for censored data needs to be used.

Mathematically, the Tobit used in this paper can be expressed as

$$\begin{aligned} Y_i &= \beta_1 + \beta_2 X_{1i} + u_{1i} && \text{if RHS} > 5 \\ &= 5 && \text{otherwise} \end{aligned}$$

where RHS = right-hand side

More specifically, the model used includes the *X* variables elicited from the survey responses, namely

$$\begin{aligned} \textbf{\textit{WTPFEE}} = {} & \beta_1 + \beta_2 \text{*HHIB} + \beta_3 \text{*HHIC} + \beta_4 \text{*HHID} + \beta_5 \text{*HHIE} + \beta_6 \text{*HHIF} + \\ & \beta_7 \text{*AGE} + \beta_8 \text{*SEX} + \beta_9 \text{* KNOWLEDGE} + \beta_{10} \text{*ENVIRO} + \\ & \beta_{11} \text{*INTAKA} + \beta_{12} \text{*MANAGE1} + \beta_{13} \text{*MANAGE2} + \\ & \beta_{14} \text{*MANAGE3} + u_1 && \textbf{if RHS > 5} \\ & = 5 && \textbf{otherwise} \end{aligned}$$

In some cases, variables were excluded for statistical purposes. The results of the model are presented in Table 7. The marginal effects generated by these results can be found in Appendix B.

Table 6: Description of the variables

Variable	*Expressed as*	*Description*	*Level*
Log(Willingness-to-pay as an entrance fee)	LWTPFEE	Dellnearised monetary value that respondent is willing to pay to enter Intaka Island	Positive Rand amount
Environmental Awareness	ENVIRO	Level of environmental awareness displayed by the respondent	0 (Very environmentally aware) – 12 (Very environmentally unaware)
Rating of Intaka Island	INTAKA	Respondent's ranking of Intaka Island relative to alternative environmental issues	1 (Most important) – 5 (Least important)
Knowledge of Intaka Island	KNOWLEDGE	Dummy variable showing the respondent's knowledge of the existence of Intaka Island before survey	Yes = 1; No = 0
Current Management Option[12]	Base Management Option: Not included in the regression	Dummy variable showing the respondent's choice for management of wetlands in the future relative to the current situation: Current baseline scenario	Yes = 1; No = 0
Management Option 1	MANAGE1	Dummy variable showing the respondent's choice for management of wetlands in the future relative to the current situation: Increased nature area	Yes = 1; No = 0
Management Option 2	MANAGE2	Dummy variable showing the respondent's choice for management of wetlands in the future relative to the current situation: Decreased nature area	Yes = 1; No = 0
Management Option 3	MANAGE3	Dummy variable showing the respondent's choice for management of wetlands in the future relative to the current situation: Indifferent	Yes = 1; No = 0
Household Income A: < R1000[12]	Base Income Category: Not included in regression	Dummy variable for household income before tax: Category A	Yes = 1; No = 0
Household Income B: R1000 –R3000	HHIB	Dummy variable for household income before tax: Category B	Yes = 1; No = 0
Household Income C: R3000 – R6000	HHIC	Dummy variable for household income before tax: Category C	Yes = 1; No = 0
Household Income D: R6000 – R15 000	HHID	Dummy variable for household income before tax: Category D	Yes = 1; No = 0
Household Income E: R15 000 – R50 000	HHIE	Dummy variable for household income before tax: Category E	Yes = 1; No = 0
Household Income F: >R50 000	HHIF	Dummy variable for household income before tax: Category F	Yes = 1; No = 0
Age	AGE	Respondent's age	Years
Sex	SEX	Gender of respondent	Male = 1; Female = 0

[12]If a qualitative variable has m categories, one must only include m-1 dummy variables in order to avoid the "dummy variable trap" (Gujarati, 1995). If this rule is not followed, there will be perfect multicollinearity. Thus, in the survey, four choices of management options were provided while only three are included in the regression. The same applies to Household Income Category.

Table 7: OLS and Tobit Estimation of Log(Willingness-to-Pay) on *Overall Sample*

Dependent variable: LTWPFEE		
Independent variable	***Linear (OLS)***	***Tobit (MLE)***
Constant	2.02	1.47
	(4.47)***	(3.063)***
HHIB	0.38	0.92
	(0.969)	(2.348)***
HHIC	0.32	0.94
	(0.821)	(2.440)***
HHID	0.3	0.95
	(0.779)	(2.471)***
HHIE	0.46	1.16
	(1.200)	(3.02)***
HHIF	0.88	1.54
	(2.127)**	(3.611)***
AGE	0.00	0.00
	(-0.109)	(0.767)
SEX	0.02	-0.04
	(0.296)	(-0.475)
KNOWLEDG	0.08	0.02
	(1.134)	(0.210)
ENVIRO	-0.04	-0.06
	(-2.452)**	(-2.879)***
INTAKA	-0.07	-0.12
	(-1.589)*	(-2.504)***
MANAGE 1	0.25	0.31
	(2.79)***	(2.996)***
MANAGE 2	0.62	0.83
	(2.452)**	(2.795)***
MANAGE 3	0.05	0.18
	(0.252)	(0.737)
Log-likelihood value	-161.366	-197.5578
Lm test for Tobit	-	548.137***
		(14)
R-squared (%)	11.67	3.17

***Statistically significant at 1% Level **Statistically significant at 5% Level
*Statistically significant at 10% Level

6.1.1 *Overall Sample*

For comparative reasons, both the Ordinary Least Squares and basic Tobit analyses were performed. Not surprisingly, the coefficient estimates on the Tobit were the same sign as the corresponding OLS estimates, and the statistical significance of the estimates were similar. Exceptions to this were coefficients on the income variables, excluding HHIF. However, although it is tempting to compare the magnitudes of the OLS and Tobit estimates, such a comparison would not be theoretically appropriate. The analytical value of this comparison lies in testing that the signs of the coefficients are similar, and verifying the data set used.

When considering the explanatory power of the Tobit on its own, the results remained interesting. The coefficients for nine of the fourteen variables included in the model were statistically significant at a 1 percent level, while the signs for ten of the fourteen variables were as expected *a priori*[13]. The level of income generated in the respondent's household was highly significant at all levels, with the marginal effects indicating that with the transition from the base household income category (<R1000) to the fifth income category (R15 000 – R50 000), for example, the willingness-to-pay will increase by approximately 116 percent.

Surprisingly, ENVIRO and INTAKA displayed negative coefficients. With regard to ENVIRO, this can be explained by considering that those who were relatively more environmentally aware were less likely to spend more on the entrance fee to Intaka Island as compared to expenditure on water recycling on the Cape Peninsula, for example. Simply, respondents were relatively more aware of other environmental issues on the Cape Peninsula that would need their money. The marginal effect of this result suggests that as respondents became more environmentally aware, they would be more inclined to spend approximately 6 percent less on the entrance fee into Intaka Island. The negative coefficient on INTAKA substantiates this argument – the higher the rating of INTAKA, the lower the level of environmental awareness of the respondent, and the lower the willingness-to-pay for an entrance fee into Intaka Island.

Finally, Table 7 indicates that MANAGE 1 and MANAGE 2 are both statistically significant at a 1 percent level. At the margin, respondents who chose Management Option 1 as their preferred option for future management were likely to increase their willingness-to-pay by approximately 31 percent. On the other hand, those who chose Management Option 2 seemed to want to spend approximately 83 percent more on the entrance fee. This result is somewhat troubling, and may illustrate a certain level of misunderstanding by respondents. Alternatively, the starting point bias that is prevalent in this model may also help to explain this confusing result, and is further discussed towards the end of the paper. Finally, although the pseudo-R^2 generated by the Tobit is a mere 3.17 percent[14], the likelihood ratio test as generated by

[13] The signs on the variables SEX, ENVIRO, INTAKA and MANAGE2 were unexpected.

[14] Econometricians have aimed to estimate an R^2 when using a limited dependent variable, commonly referred to as the Pseudo-R^2. It is calculated within the LIMDEP programme according to the McKelvey and Zavoina measure, and has been justified as a fair "goodness-of-fit" measure due to the fact that it is (i) a measure of the reduction of the variability of the dependent variable through explanatory variables, and (ii) the square of the simple correlation coefficient between predicted and

LIMDEP, a clearer valuation of the goodness-of-fit of the model, suggests that the Tobit model is statistically significant at a 1 percent level.

Given the evaluative power of the Tobit for the *Overall Sample*, corresponding Tobits for the various groups of respondents, namely *Shop employees*, *Shoppers* and *Office employees*, have been estimated in Table 8. From this, the significance of the variables within the separate categories can be determined.

Table 8: Tobit regression results for *Shop employees, Shoppers* and *Office employees* as compared to the *Overall Sample*

Dependent variable: Log(WTPFEE)

	Overall	***Shop employees***	***Shoppers***	***Office employees***
Constant	1.47 (3.063)***	2.74 (3.292)***	2.24 (-3.390)***	1.39 (2.491)***
HHIB	0.92 (2.348)***	-0.25 (-0.432)	-	-
HHIC	0.94 (2.440)***	-0.27 (0.586)	0.2 (0.492)	-
HHID	0.95 (2.471)***	-0.45 (-0.598)	0.22 (0.608)	-0.17 (-0.742)
HHIE	1.16 (03.02)***	0.1 (0.168)	0.23 (0.604)	0.10 (-0.435)
HHIF	1.54 (3.611)***	-	0.81 (1.917)**	0.11 (0.293)
AGE	0.00 (0.767)	0.01 (0.722)	0.01 (0.463)	0.00 (-0.363)
SEX	-0.04 (-0.475)	-0.22 (-1.137)	0.01 (0.053)	-0.07 (-0.410)
KNOWLEDG	0.02 (0.210)	0.07 (0.437)	0.19 (1.403)	-0.19 (-0.683)
ENVIRO	-0.06 (-2.879)***	-0.06 (-1.355)	-0.05 (-1.380)	-0.05 (-1.363)
INTAKA	-0.12 (-2.504)***	-0.21 (-2.367)**	-0.08 (-0.913)	0.12 (1.558)
MANAGE 1	0.31 (2.996)***	0.33 (1.956)**	0.01 (0.823)	0.37 (1.524)
MANAGE 2	0.83 (2.795)***	-0.03 (-0.044)	0.73 (1.969)**	-
MANAGE 3	0.18 (0.737)	1.21 (1.657)*	0.02 (0.049)	-0.37 (-0.841)
Log-likelihood value	-197.5578	-84.43	-72.84	-35.83
Lm test for Tobit	548.137*** (14)	123.898*** (13)	773.789*** (13)	1595.531*** (11)
R-squared (%)	3.17	6.87	11.72	19.9

***Statistically significant at 1% Level **Statistically significant at 5% Level
*Statistically significant at 10% Level

actual values of the dependent variable within the sample (Dhrymes, 1986). Veall and Zimmerman (1996) have determined that the McKelvey and Zavoina measure scores consistently well relative to other measures (Veall and Zimmerman, 1996, p. 7-10).

6.1.2 *Shop employees*

Initially, one notices that there were no respondents in the highest income bracket, removing this variable from the basic Tobit. Contrary to the *Overall* model, ENVIRO was statistically insignificant. Thus, the level of environmental awareness in this group of respondents is low. The mean willingness-to-pay of this group verifies this – it was the lowest of all the groups at R8.38 (Table 4). Furthermore, the negative relationship between INTAKA and LWTPFEE implies that those who rated Intaka Island as a relatively more important environmental issue would be prepared to pay less as an entrance fee – a similar result to that found in the *Overall* sample. INTAKA is statistically significant at a 5 percent level, and at the margin, the result indicates that a one percent increase in the rating of Intaka Island would lead to a 17 percent decrease in the willingness-to-pay of the respondent.

MANAGE 1 is also statistically significant at a 5 percent level (p = 0.00505). This implies that, conditional on LWTPFEE being positive, the choice of Management Option 1 as compared to the current scenario would increase a respondent's willingness-to-pay by 32.82 percent. The coefficient on the statistically significant MANAGE 3 is encouraging, as it implies that, despite being indifferent to future management of wetlands such as Intaka Island, the willingness-to-pay of these respondents is almost 100 percent higher than had they chosen the current scenario.

6.1.3 *Shoppers*

Despite the statistical significance of the model at a 5 percent level, the Tobit generated for *Shoppers* yielded few statistically significant explanatory variables. The income variable HHIB has been removed from this Tobit as it has a disproportionate impact on the Tobit - it contains one observation, and when included, reduces the explanatory power of the model to 0.2 percent. Nevertheless, the level of income earned in a household is important, as the marginal effect of earning greater than R50 000 per month on LWTPFEE was an increase of approximately 81 percent in willingness-to-pay.

In addition to this, the interesting result found on MANAGE 2 in the *Overall* model is explained in this basic Tobit on *Shoppers* as the majority of the respondents who chose this management option fall into the *Shoppers* category. However, the impact of the statistical significance of MANAGE 2 is not likely to be proportionately

influential on a respondent's willingness-to-pay, as the marginal effect of choosing the decreased nature area management option over the current scenario decreases willingness-to-pay by only 2.6 percent.

6.1.4 *Office employees*

As no respondents in this category earned less than R 3 000, and given the high collinearity between HHIB and HHIC, these variables were both removed for explanatory purposes. Despite statistical significance of the overall model at a 1 percent level, the explanatory power of this Tobit was relatively lower than the alternative models. This can be attributed to the fewer observations in the model (n=49). In addition to this, only INTAKA and MANAGE 1 are partially statistically significant (both have *p*-levels = 0.12). Despite this, the positive sign on INTAKA implies an alternative perspective to that offered by the *Overall* sample on the rating of Intaka Island - the marginal effect of a 1 percent increase in a respondent's rating of Intaka Island led to approximately an 11 percent increase in willingness-to-pay. However, this result is questionable given the sample size.

Although an analysis of the impact of the independent variables on the separate categories of *Office employees* is desirable, the sample size itself does not allow for this.

6.1.5 *Survey Result Caveats*

These results suggest a level of starting point bias. The problem arises when respondents are given a starting level at which to place their willingness-to-pay. In this case, although there was a level of starting point bias, the stipulation of the R5 entrance fee was necessary information given that it is the current price being levied. (The Tobit model was selected to help counter this.) In addition, the responses elicited were likely to have suffered from embedding, as empirics have indicated. For example, respondents were likely to have chosen the first management option if they had already displayed an increased willingness-to-pay for the entrance fee.

6.2 Revealed Preference Method: Hedonic Pricing

The hedonic pricing system is based on the premise that the price of a property is determined by a set of attributes, including environmental quality variables. Thus, theory suggests that the prices of the properties in the vicinity of Intaka Island should reflect the utility derived from this environmental amenity.

Given the existence of both commercial and residential properties in Century City (see Figure 2), evaluation of the property prices under the hedonic approach included both of these areas.

6.2.1 *Commercial properties*

As previously discussed, the commercial properties in the area can be divided into two groups, namely the offices adjacent to Intaka Island (*Adjacent*) and those properties situated on the other side of Century Boulevard (*Opposite*). A certain portion of the value derived from these properties should be reflected in the price at which the property is sold. More specifically, the value derived from the environmental amenity is a function of the proximity to that environmental amenity. Simply, the closer the property is to the environmental amenity, the higher the price of the property. Thus, the property prices of the *Adjacent* offices should be higher than the *Opposite* prices, given the proximity to Intaka Island.

The basic premise is therefore

> ***Property price*** = Function (*property variables, neighbourhood variables, accessibility variables*)

Thus, variables such as erf size, the level and quality of security, and proximity to both the Cape Town Central Business District and other commercial businesses should be reflected in property price. This aspect has not been regarded by the developers, and freshly developed commercial space in Century City is sold at R1 500 per square metre, irrespective of proximity to Intaka Island (Harbough, pers comm. April 2004; Westerland Property Services, pers comm. May 2004). The value derived from the environmental amenity, namely Intaka Island, is not included in the price at which the commercial property is sold. Note, however, that there is not yet a significant secondary market, and prices are determined using the developer's own estimate.

The potential for these price structures to change once the property market in the area is secondary, as opposed to new development, is seen by analysing the willingness-to-pay for views of Intaka Island. In the absence of these estimates, surrogate estimates can be inferred from the willingness-to-pay for an entrance fee by those who view Intaka Island frequently as compared to those who do not view Intaka Island. More specifically, the surveys conducted and previously analysed indicated that the mean willingness-to-pay of respondents in the *Adjacent* and *Opposite* groups of *Office employees* were substantially different, as shown in Table 9.

Table 9: Revealed preference for Intaka Island

	Adjacent	***Opposite***
Mean WTP as an entrance fee (Rand)	10.16	7.89
Mean level of environmental awareness	7.25	6.25
Mean rating of Intaka Island	2.81	3.53

Adjacent respondents revealed a mean willingness-to-pay of R10.16, while respondents in the *Opposite* office area revealed a mean willingness-to-pay of R7.89 - approximately a 29 percent increase. In addition to this, respondents in the *Adjacent* category rated Intaka Island relatively higher against the alternative environmental issues when compared to the *Opposite* respondents. These results imply that there is, in fact, utility derived from the environmental amenity for those who are in closer proximity to it. The commercial market does not reflect this utility: the entire area is currently administered as one unit with a single administered price of R1 500 per square metre.

6.2.2 *Residential properties*

The Island Club residential development is situated opposite the Canal Walk Shopping Centre (see Figure 4) and aims to create an upmarket "island lifestyle" residential paradise. It was launched in May 2003 and generated R 200 million in sales within a week of its launch (Century City Fact Sheet, August 2003). One of the most influential selling points associated with *The Island Club* residential properties is the water and canals surrounding the apartments. In addition to this, Intaka Island is also a selling point mentioned by estate agents of the development (Cross, pers. comm. May 2004).

Once again, given the proximity of these properties to Intaka Island, and considering that it is mentioned as an input to sales, the prices of the units available should be a function of environmental quality variables. The closer the unit is to Intaka Island, the higher the price of the unit, as the price should reflect the utility derived from the proximity to the amenity. However, when one considers the design of *The Island Club* as shown in Figure 4 in conjunction with the property prices displayed in Table 10, this does not seem to be the case[15].

Table 10: *The Island Club* Property Prices

Date of Sales	***Position***	***Unit size***	***Average Property Price***[1]
May/June 2003	*Majorca*	1 bedroom	R 609 000
		2 bedroom	R 650 000
		3 bedroom	R 1 118 000
July/August 2003	*Menorca*	1 bedroom	R 645 000
		2 bedroom	R 685 000
		3 bedroom	R 1 175 000
September/October 2003	*La Savina*	1 bedroom	R 675 000
		2 bedroom	R 720 000
		3 bedroom	R 1 240 000
January/February 2004	*St Tropez*	1 bedroom	R 825 000
		2 bedroom	R 870 000
		3 bedroom	R 1 425 000
March/April 2004	*Portofino*	1 bedroom	R 870 000
		2 bedroom	R 950 000
		3 bedroom	R 1 635 000

[1]These prices were calculated as the average between the return on investment (Cross, Rable Property Projects, May 2004) and selling prices to the public (Rabie Property Projects, 2004).

Given that the units available in *Majorca* and *La Savina* are roughly identical, the difference between the unit prices in *Majorca* and *La Savina* suggest that the proximity to Intaka Island could be reflected in property prices. It is unlikely that the two month time-lag between the selling times would account entirely for the difference in property prices. More specifically, as the buyer moves closer to Intaka Island, the average property price on a one-bedroom unit, for example, increases from R 609 000 to R 675 000. On the other hand, the average price of a one-bedroom unit in *St Tropez* is approximately R 825 000. Finally, the average property price of a one-bedroom unit in *Portofino* is R 870 000. Thus, despite being further

[15] In total, there are eight residential property areas, of which five are reflected in Table 10.

Figure 4: Island Club Residential Development

away from Intaka Island, average property prices in *St Tropez* and *Portofino* are higher, suggesting either that other factors such as time-lags are at play, or alternatively, that the value derived from Intaka Island as an environmental attribute has not been accounted for by the estate agents in property prices.

For further evaluation, the residential areas that consist of dual apartments on one level were analysed. Of the eight residential areas, only two fall into this category. More specifically, *Capri* and *Palma* have apartments that face both South (towards the water) and North (towards Ratanga Road, away from the water), as seen in Figure 4. Although specific price differentials are unavailable, it is estimated that there is approximately R20 000 to R30 000 difference in the price of a south facing apartment with water frontage as compared to those apartments facing North with no water frontage (Scrooby, pers. comm. July 2004).

For comparative purposes, the price differential between houses facing north or south at the Marina Da Gama complex was evaluated. The Marina Da Gama complex is also situated on the Cape Peninsula, and was designed with Zandvlei, a neighbouring wetland (and the associated aesthetic and recreational services) as its main selling point. Estate agents argued that a house with water frontage and south facing would sell at approximately a 25 percent premium to an identical house without water frontage (van Zyl, pers. comm. 2001). This premium would rise to 50 percent if the house were north facing with water frontage (van Zyl, pers. comm. 2001).

These results indicate that there is a significant value attached to a view of water. Houses with water frontage undoubtedly sell at a premium above houses without views over the water.

However, the property prices of the units available at *The Island Club* should, in fact, reflect two environmental attributes, namely Intaka Island *and* the water surrounding the properties within the canals. The distinction between these amenities is not clear given that the cleanliness of the water is dependent on Intaka Island. As previously mentioned, Intaka Island "serves as a natural purification system to filter and cleanse the water in the canal system linking the various elements in Century City" (Century City Fact Sheet, August 2003), including *The Island Club* residential development. By comparing the property prices of the units available in *The Island Club* with property prices of similar units available adjacent to Century City, namely the *Villa Italia*

residential property development, the value derived from the water may be estimated.

Table 11: Property prices of units in *The Island Club* and *Villa Italia*

Unit Size	*The Island Club*	*Villa Italia*[1]	*Difference*
1 bedroom unit	R 675 000	R 525 000	R 150 000
2 bedroom unit	R 720 000	R 640 000	R 80 000
3 bedroom unit	R 1 240 000	R 905 000	R 335 000

[1]Prices reflected are the averages as provided by Dante Fratti, Villa Italia Property Development, May 2004

The prices shown in Table 11 are for September 2003. The attributes associated with the units in *The Island Club* and *Villa Italia* are similar, including the erf sizes of the available units, the style of the available units, and the security within the development. The primary difference between these units is the canal system surrounding *The Island Club* and the proximity to Canal Walk Shopping Centre (Cross, pers. comm. May 2004; Fretti, pers. comm. May 2004). However, there is a substantial difference in the property prices: there is an average difference of approximately R 188 000 between the units available in *The Island Club* and *Villa Italia*. A portion of this difference in property price may be attributable to positive externalities flowing from the proximity to Canal Walk Shopping Centre[16], but this seems unlikely to account for the total R188 000 price differential (Scrooby, pers. comm. June 2004). A significant proportion of the price differential can be viewed as the positive value attached to the water within the canals surrounding *The Island Club*.

This result indicates that there is positive utility derived from the water in the canal system, and that this value is dependent on the existence and maintenance of Intaka Island. The final phases of development will begin in October 2004, and these residential properties will be closer to, and surrounding Intaka Island. Unfortunately, the estimated prices of these residential prices are currently unavailable[17]. Nevertheless, it has been suggested that these property prices will reflect the utility derived from the environmental amenities associated with Intaka Island (Scrooby, pers. comm. June 2004; Cross, pers. comm. April 2004).

[16] The convenience of proximity to Canal Walk Shopping Centre is regarded as a major positive drawcard for estate agents in *The Island Club*.
[17] The proposed price listing will be available from August 2004 from Rabie Property Projects (Scrooby, June 2004).

Interestingly, the property market at the Marina Da Gama complex has grown to reflect the utility derived from Zandvlei and its associated services. The largest premia in this complex are achieved by the few houses that face westward over Zandvlei (as opposed to facing over water to another's house). These properties can be divided further into two groups: houses that look over Park Island, and; houses that look over a grassed public park area. Park Island is an island in Zandvlei that is covered by well-maintained indigenous vegetation with good bird life. It also offers low intensity recreation, such as walking trails. Exact estimates of the premia in this area are difficult to calculate as no houses are the same, but premia for this group are likely to exceed the 50 percent premium charged on the north facing houses (van Zyl, pers. comm. 2001).

Further analysis of these price differentials will be extremely helpful in analysing the indirect value that is attached to Intaka Island. Preliminary results suggest that there is an indirect value which, although currently immeasurable due to the effect of administered prices, is recognised by estate agents and attached to Intaka Island and the environmental services it provides. (An article discussing the growing interest in *The Island Club* can be found in Appendix C : *Business Day,* 21 July 2004).

7. CONCLUSION

The research described in this paper was intended to inform an existing environmental management plan. Although an EIA typically provides information on the status of an environmental resource, stated and revealed preference methods can assist when used to estimate the utility derived from an environmental resource. While these two techniques are dissimilar - CVM uses direct elicitation while hedonic pricing uses revealed preferences in the property market – the results these approaches yielded were similar.

7.1 Findings from the Contingent Valuation Method

The purpose of contingent valuation in this paper was to determine whether, and to what extent, the public itself placed any value on the nature area. The surveys revealed that the members of the public could derive utility as both use and existence values from Intaka Island. This was supported by the differential between the current entrance fee and the mean willingness-to-pay for this entrance demonstrated by respondents to the surveys – the mean willingness-to-pay being almost double the current entrance fee. This differential between current price and willingness-to-pay was displayed by the three separate groups involved in the survey. Furthermore, *Adjacent* respondents were willing to pay substantially more than respondents categorised as *Opposite*. This result suggests that Intaka Island not only provided utility but those who enjoyed this utility indicated it through their willingness-to-pay for the site.

The Tobit analysis of the data from the CVM suggested that the typical respondent's level of environmental awareness was statistically significant in the *Overall sample*, implying that Intaka Island has environmental value for those who are environmentally astute. In addition to this, as expected, income is a significant determinant of a respondent's willingness-to-pay. Finally, respondents' placement of value on the future management of wetlands such as Intaka Island, "MANAGE 1", was statistically significant, suggesting a positive existence or bequest value for environmental resources such as Intaka Island.

7.2 Findings from the Hedonic Pricing Analysis

Hedonic analysis of commercial properties failed to show significant utility accruing from Intaka Island. The office blocks situated adjacent to and opposite Intaka Island are priced identically, despite the willingness-to-pay differential displayed by the respondents to the CVM survey. On the other hand, an examination of the residential properties surrounding the area, namely *The Island Club* and *Villa Italia,* exposed the high level of utility derived from the water in the Perimeter Canals. Although the developers may have recognised the need for premia on residential properties with water frontage, it seems that the current market for commercial properties is administered by developers (a demand and supply based market not yet having emerged). Commercial property prices surrounding Intaka Island have not been derived through market dynamics, but rather as a result of developer intentions. This is an interesting result, given the environment/view based differentials in Cape Town's residential property market (where properties facing Park Island in the Marina Da Gama complex enjoy estimated premiums in excess of 50 percent). In the commercial property market, developers seem to feel that there is little potential for environmental assets to engender financial gain.

7.3 Overall Findings and Recommendations for the Future

Despite the existence of a competitive and well-informed property market in Cape Town, both the use and non-use values attached to an environmental resource such as Intaka Island are frequently ignored. This paper suggests that its null hypothesis holds – Intaka Island is undervalued as an environmental resource. However, in addition to the direct utility this wetland provides, it also has an existence value, recognised by the public and determined by the high conservation values flowing from its vegetation and its use as a breeding site by waterbirds. The combination of these factors suggests that Intaka Island is an important multi-purpose nature area. In light of the increasing development surrounding Intaka Island, organisations such as the Blouvlei Environmental Committee should ensure that the biodiversity of Intaka Island remains sustainable. The survey showed that the public are interested and, when informed, can derive utility from this type of environmental facility. Increased advertising and marketing of Intaka Island will ensure both greater visitor numbers and increased revenue. Moreover, it will ultimately enhance public welfare.

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APPENDIX A: Complete survey as used in the case study: English

How to fill out this questionnaire:

The questions are asked in a number of different ways. In most cases, you only need to tick the box which is closest to your view on the issue. Here is an example:

EXAMPLE:

Do you think that the government should spend more or less on the environment?

Spend more on the environment ☑

Spend less on the environment ☐

Don't know ☐

If you think that the government should spend more on the environment, you would tick the box as indicated.

Sometimes, you need to write an answer. In these cases, simply write your answer in the space provided.

Completion of this survey is voluntary.

All your answers will be kept *strictly confidential*.

SECTION A

Your views on the management of the Intaka Island Nature Area

Two issues facing people in Cape Town are the fall in number and quality of wetlands and pans on the Cape Peninsula. This has occurred as a result of development over the last 30 years.

One remaining wetland site is the 16-hectare nature area next to Century City. This area is known as Intaka Island, and used to be called the Blouvlei wetland.

What is Intaka Island?

Intaka Island consists of two main areas:

(i) the 8-hectare constructed wetland zone
(ii) the 8-hectare seasonal salt pan zone

The *wetland* zone improves the water quality of the water going into the canal system surrounding Century City. The *seasonal salt pan* provides a habitat for rare and endangered fynbos species and waterbirds, giving it *high conservation value*.

In addition to this, the constructed wetland provides a habitat for breeding waterbirds. 127 bird species have been identified on a regular basis in the Intaka Island vicinity. The wetland provides breeding and roosting opportunities for birds from other local and international areas. Furthermore, it is the first place in the world to introduce a man-made breeding structure. These waterbirds breed in only a few other wetlands on the Cape Peninsula.

What environmental issues are important?

Before considering the importance of Intaka Island, we would first like you to think about some environmental issues, and rank them according to your views of their importance.

Please could you rank these environmental issues according to their level of importance from your perspective. (eg. 1 is the most important issue, 5 is the least important issue)

Environmental Issue	Ranking
Controlling urban sprawl on the Cape Peninsula	
Improving water quality of the Liesbeek River	
Maintaining wetland quality of Intaka Island	
Promoting water recycling in Cape Town	
Preventing over-fishing on the Cape Peninsula	

SECTION B

Had you ever heard of the wetland next to Century City before this questionnaire?

Yes ☐ No ☐

These are the current benefits associated with Intaka Island.

Feature	
Size of Nature Area	16 hectares
Percentage area of healthy Fynbos	74
Number of bird species	130
Number of waterbird species	52
Number of waterbird species breeding	48
Water quality of the canals	Good
Entrance fee	R5

Do you think that R5 is a fair price to charge visitors to visit the area?

Yes ☐ No ☐

Would you be willing to pay a higher entrance fee to visit the area?

Yes ☐ No ☐

If yes, how much would you be willing to pay? Please keep in mind your available income and all the other things you have to spend money on.

R_____

It is possible to get to Intaka Island by car and by boat via the canal system. The service by boat is unfortunately currently unavailable, yet has been offered in the past. Would you be more interested in visiting Intaka Island

d) by car ☐

e) by boat from Canal Walk ☐

f) Both of the above ☐

What do you think is a fair price for a **trip by boat**, *including* the entrance fee, to the nature area?

R_____

At the price that you have chosen, would you use this service?

Yes ☐ No ☐

SECTION C

What should we be doing?

The Cape Peninsula is an internationally known centre of bio-diversity. This species diversity is partly a result of the range of habitats available – mountains, coastal and wetland areas all exist in this small area. Unfortunately, wetland areas have been threatened by development. As a result, certain plant and bird species are becoming threatened on the Peninsula.

We would like to find out how members of the public would like Intaka Island and other wetlands to be managed in the future. We have prepared a set of management options, and would like to know which management option you prefer.

Please give your personal view and when selecting an option, keep in mind your available income and the other things which you have to spend money on.

Feature	Option A: Current situation	Option B: Increased nature area	Option C: Reduced nature area
Size of nature area	16 hectares	21 hectares	10 hectares
Percentage area of healthy Fynbos	74	93	24
Number of bird species	130	207	52
Number of waterbird species	52	65	16
Number of waterbird species breeding	48	63	28
Entrance fee	R5	R10	R0

I would choose Option A ☐

I would choose Option B ☐

I would choose Option C ☐

I would not choose any of these options. ☐

SECTION D

Finally, we'd like to ask you a few questions regarding your household.

Occupation:_____

What is your total household monthly income before tax?

<R1000	☐	R1000 – R3000	☐
R3000 – R6000	☐	R6000 – R15 000	☐
R15 000 – R50 000	☐	>R50 000	☐

Age:_____

Sex: Male ☐ Female ☐

Thank you for your time.
Please note, there are no plans to change the entrance fee at this stage.

APPENDIX B: Comparison of marginal effects of explanatory variables on *Overall sample*, *Shop employees*, *Shoppers* and *Office employees*

Dependent variable: Log(WTPFEE)

	Overall	***Shop employees***	***Shoppers***	***Office employees***
Constant	1.48	2.74	2.24	1.39
HHIB	0.92	-0.25	-	-
HHIC	0.94	-0.27	0.2	-
HHID	0.95	-0.45	0.22	-0.17
HHIE	1.16	0.1	0.23	0.10
HHIF	1.54	-	0.81	0.11
AGE	0.00	0.01	0.01	0.00
SEX	-0.04	-0.22	0.01	-0.07
KNOWLEDG	0.02	0.07	0.19	-0.19
ENVIRO	-0.06	-0.06	-0.05	-0.05
INTAKA	-0.12	-0.21	-0.08	0.12
MANAGE 1	0.31	0.33	0.01	0.37
MANAGE 2	0.83	-0.03	0.73	-
MANAGE 3	0.18	1.21	0.02	-0.37
Conditional mean	2.0669	1.841	2.285	2.0168
Adjustment factor	0.997	0.9973	1.00	1.00

APPENDIX C: Newspaper article recognising the growing importance of Intaka Island